



NEW ZEALAND'S
BIOLOGICAL
HERITAGE

Ngā Koiora
Tuku Iho

National
Science
Challenges

Big Science Ideas

For the transformational shift to eradication



Andrea Byrom

New Zealand's Biological Heritage

Ngā koiora tuku iho

A National Science Challenge (10-year collaboration)

- 11 Challenges
- Big strategic goals for NZ



National **Science** Challenges

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Landcare Research
Manaaki Whenua



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National
Science
Challenges



MISSION

Reverse the decline of New Zealand's biological heritage, through a national partnership to deliver step change in research innovation, globally-leading technologies, and community and sector action





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National
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MISSION

“Doing science in a much wider context”



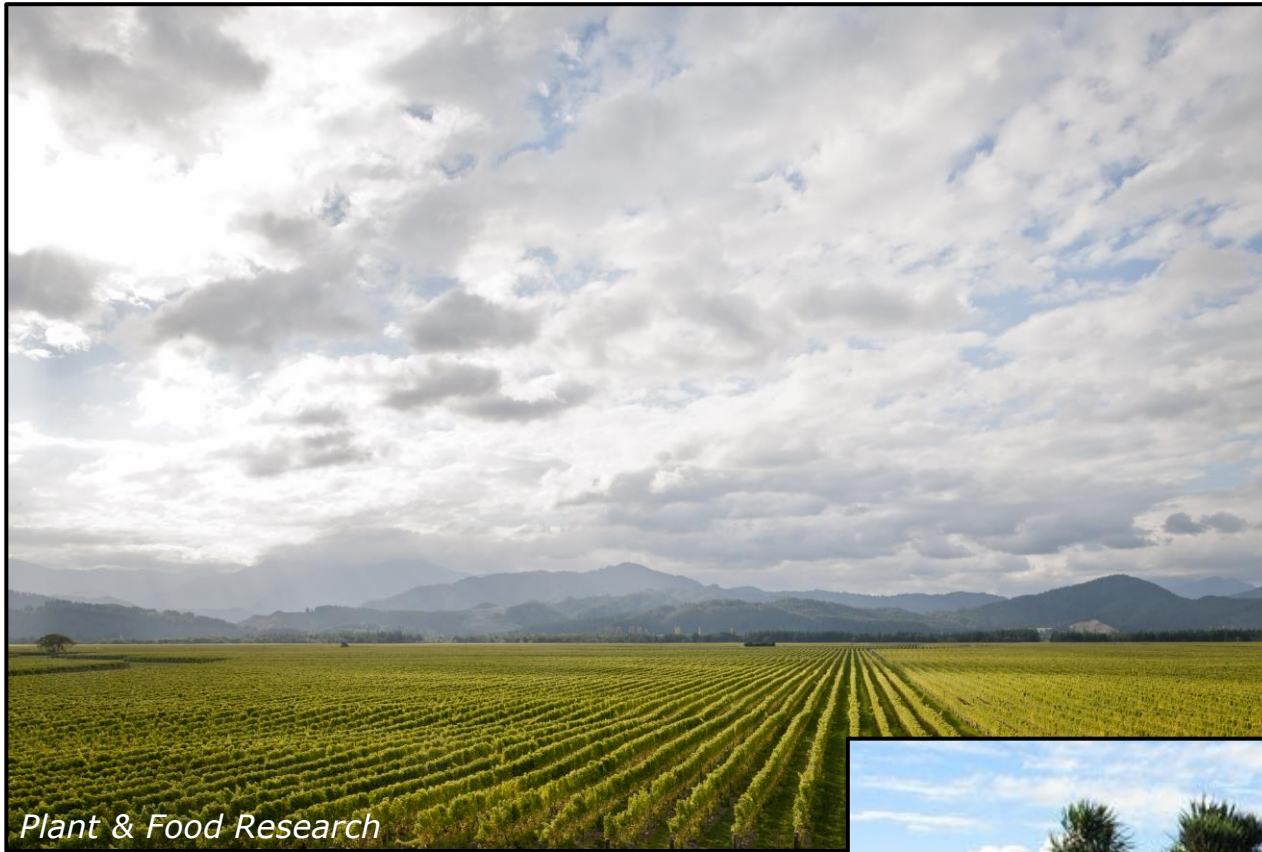
Production and conservation sectors



Terrestrial and freshwater ecosystems

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Biosecurity and Biodiversity

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Our Partners

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Ministry for Primary Industries
Manatū Ahu Matua



Plant & Food
RESEARCH
RANGAHAU AHUMĀRA KAI



THE UNIVERSITY OF
WAIKATO
Te Whare Wānanga o Waikato

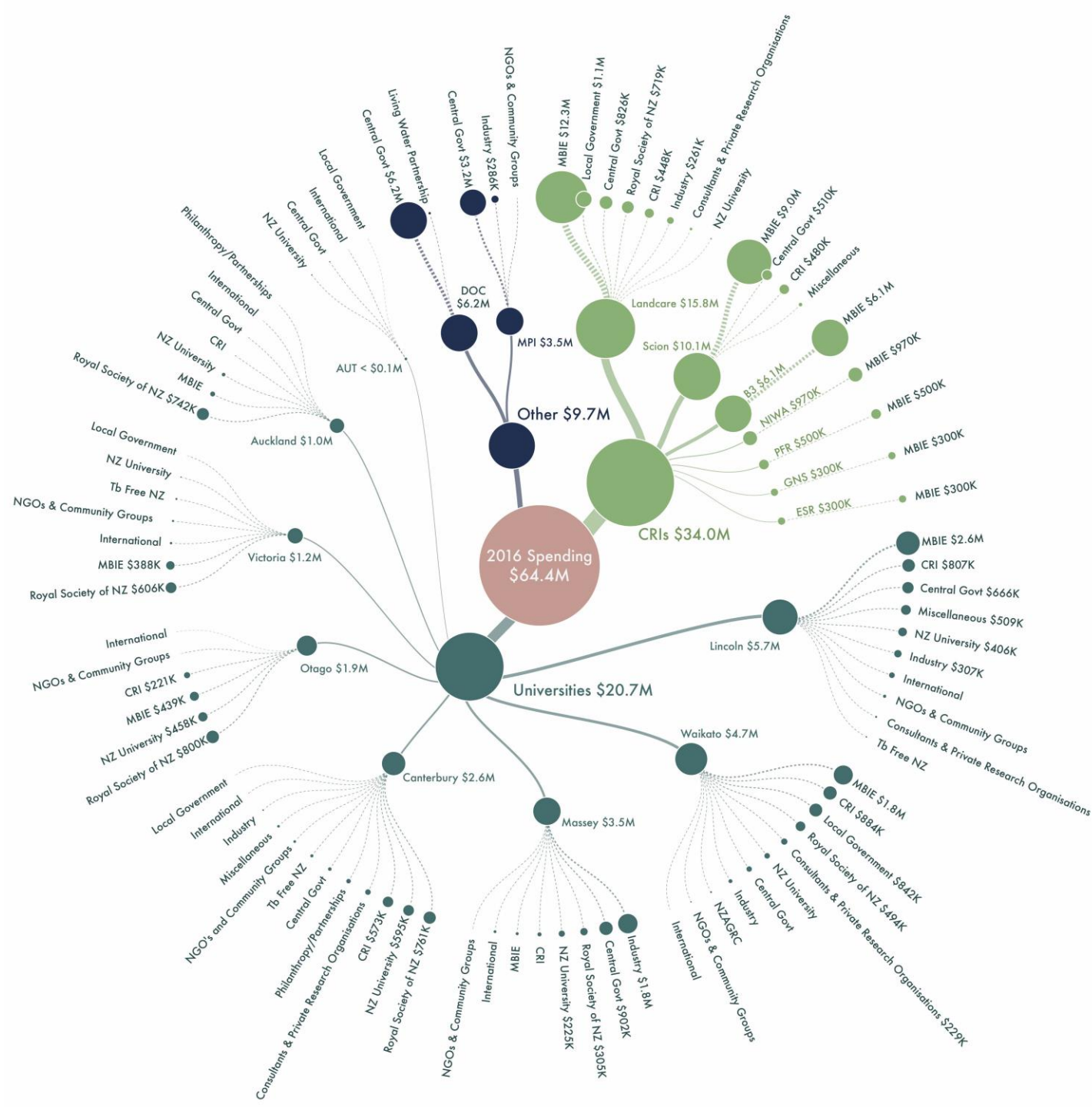


Department of
Conservation
Te Papa Atawhai



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Our Goals

With our partners we will:

- 1 Protect and restore: secure threatened species and resilient ecosystems
- 2 Eliminate threats: weeds, pests, mammal predators, and pathogens
- 3 Detect and eradicate: zero impacts from biosecurity incursions
- 4 Restore healthy freshwater: wai taonga and mahinga kai
- 5 Track our progress: A bioheritage scorecard for Aotearoa

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9



The Norway rat is one of eight predators targeted for eradication in New Zealand.

© Tim James/Mabel Gray/Alamy Stock
Photo

July 2016

New Zealand's 'mind-blowing' goal: Rat-free by 2050

“No-one can accuse New Zealand’s government of a lack of ambition...”

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The Economist

World politicsBusiness & financeEconomicsScience & technologyCulture

Conservation

New Zealand’s war on predators

All latest updates

The biggest plan yet to rid the islands of animals threatening local flora and fauna

Aug 2nd 2016 | Science and technology

Timekeeper

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FLPA

theguardian

ball opinion culture business lifestyle fashion environment tech travel

US americas asia australia africa middle east cities development

No more rats: New Zealand to exterminate all introduced predators

Possums, stoats and other introduced pests to be killed in ‘world-first’ extermination programme unveiled by PM



IS THIS OUR MOON SHOT?

Ten years ago, even the most visionary conservationists thought ridding New Zealand of predators was a pipe dream. Now the PM says, “Let’s do it.”

WRITTEN BY **KENNEDY WARNE**



“Bold, ballsy, and just the sort of thing we should do...”



THE
Cacophony
PROJECT

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[Blogs](#) / [grant's blog](#) / 2050 target for predator free NZ is crazy - 2040 seems more likely

2050 TARGET FOR PREDATOR FREE NZ IS CRAZY - 2040 SEEMS MORE LIKELY



The Blog



Rejoice: a predator-free NZ is no longer a dream. Now, let's talk about the money. And the cats

Gareth Morgan / July 26, 2016 / [Environment](#) / [31 Comments](#)

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Home News Radio Series & Podcasts Topics

COMMENT & ANALYSIS / ENVIRONMENT

War on pests avoids targetting pets and dinner

6:27 am on 30 July 2016

[Twitter](#) [Facebook](#) [Email](#) [More](#)

Dave Hansford* - (dave.hansford@me.com)

Opinion - Introduced pests, according to Landcare Research, kill some 25 million native birds every year.



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BioScience Advance Access published March 11, 2015

Forum

Predator-Free New Zealand: Conservation Country

JAMES C. RUSSELL, JOHN G. INNES, PHILIP H. BROWN, AND ANDREA E. BYROM

Cost: \$9B (NPV over 50-year time frame)

With *current* tools and technologies

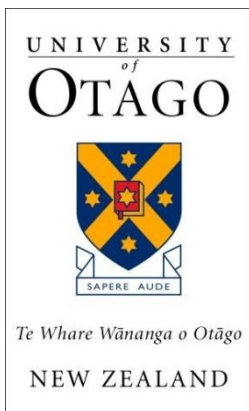


High tech solutions to invasive mammal pests

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➤ Dr James Russell (University of Auckland)

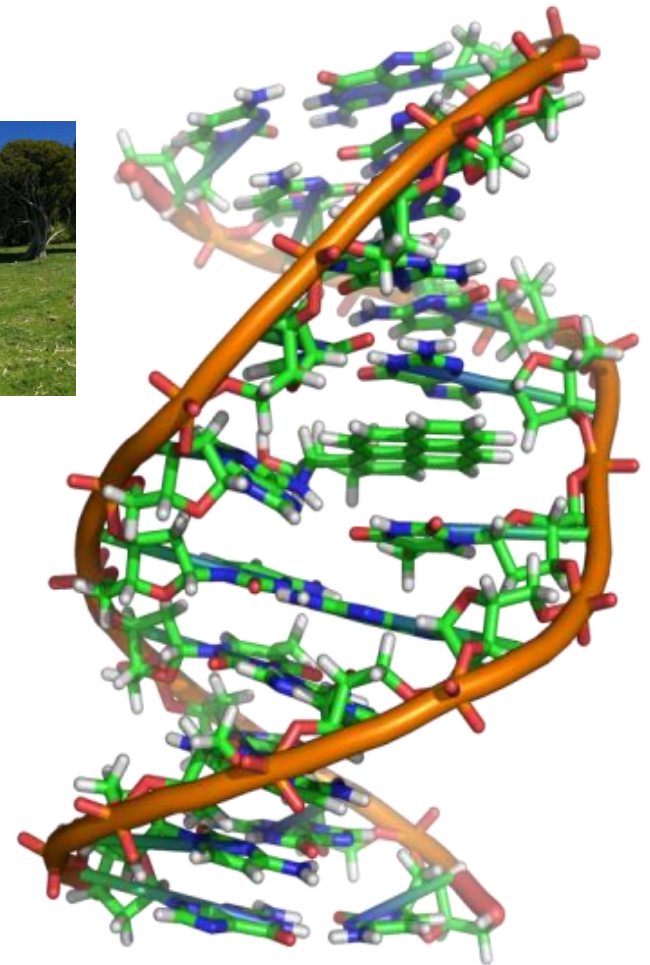


Gene-based population suppression



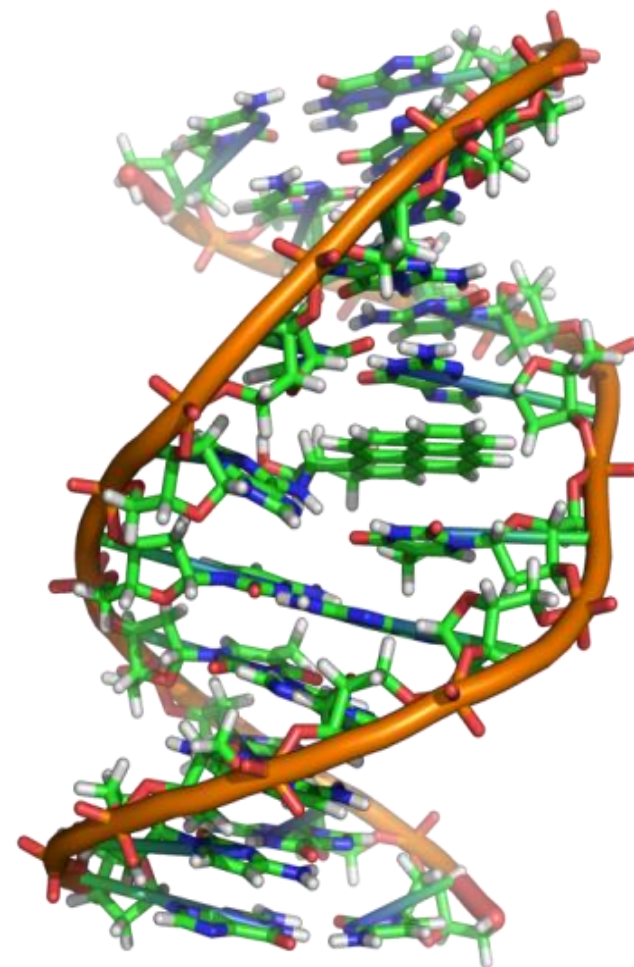
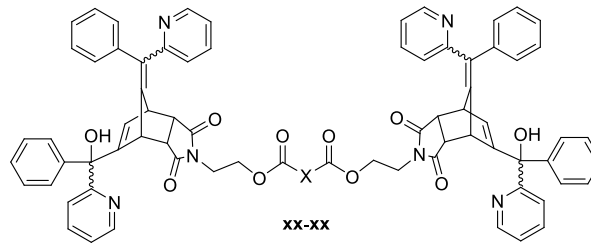
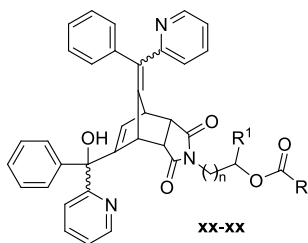
➤ Genomics

- Goal: Identify, out of several options the best way forward for New Zealand; facilitate and benefit from leading international groups



Species-specific toxins

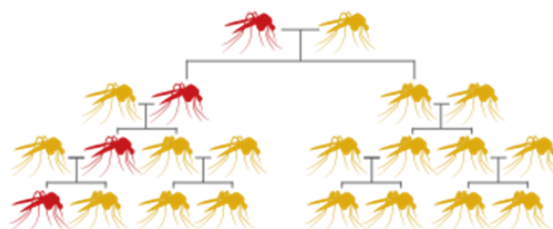
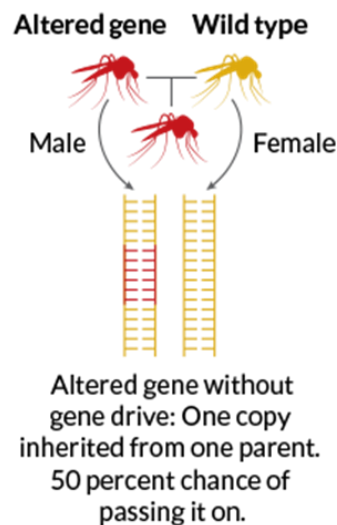
- 'Genome mining'
 - Goal: Single control application (bait) targeting multiple pests with acceptable humaneness and no non-target or environmental impacts



Gene drives

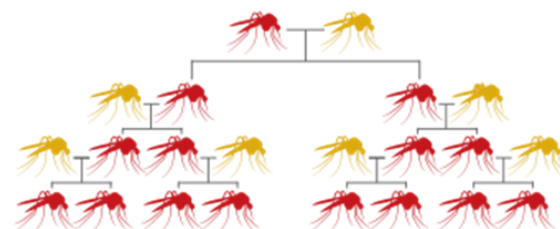
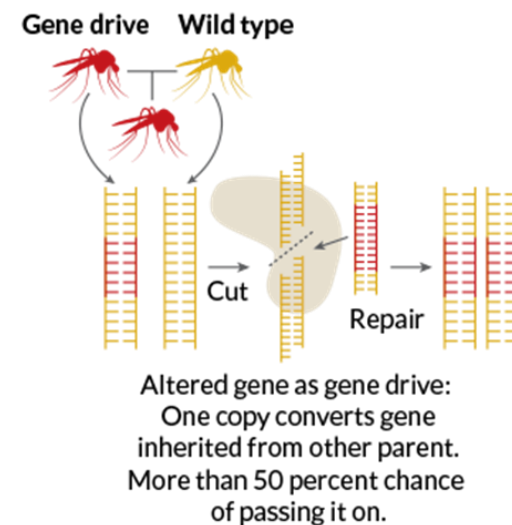
- Use 'selfish' genetic elements to spread genes through pest populations
- No proof-of-concept yet
- Large and expensive technical hurdles
- Policy hurdles
- Regulatory hurdles
- Social licence to use gene editing for pest control?
- Join leading international collaborations

Normal inheritance



Altered gene does not spread

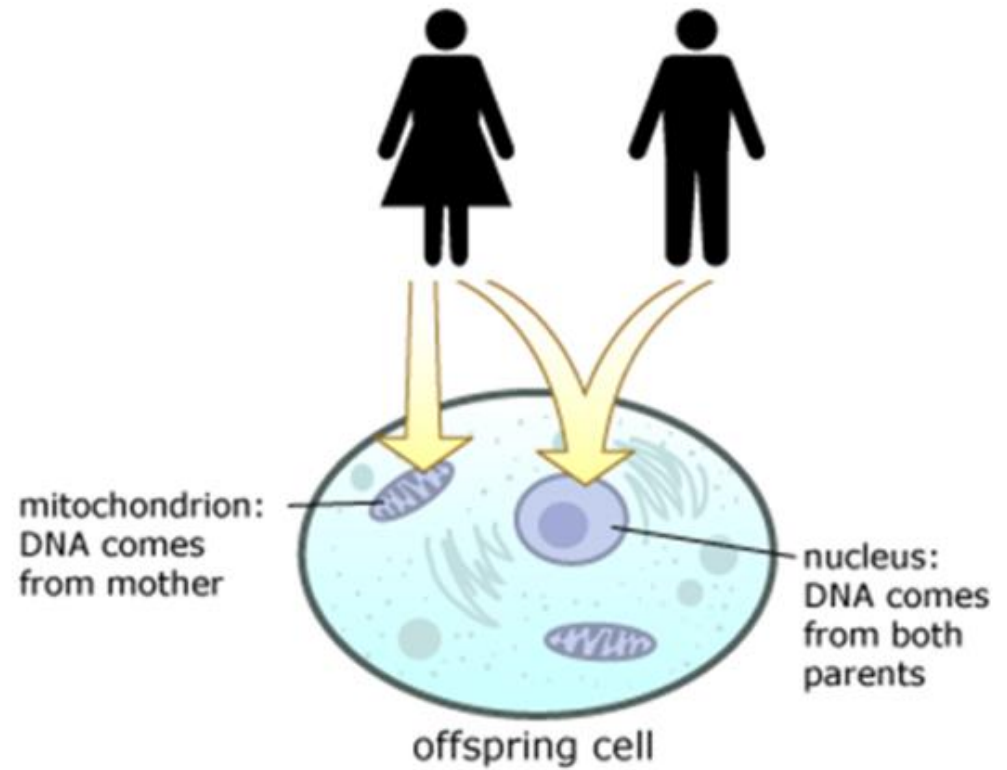
Gene drive inheritance



Altered gene is almost always inherited

Trojan Female Technique

- Maternally transmitted
- Decrease male fertility
- Selective breeding



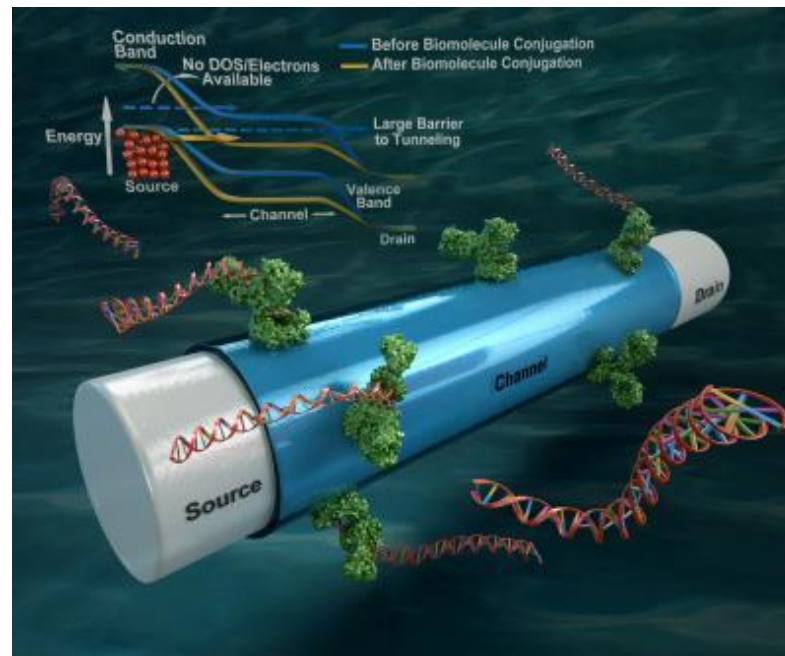
New lures (stoats)

- A new paradigm for lure development
 - Higher-order predator scent is attractive to stoats
 - Field data shows 300% increase in stoat interactions
 - Goal: 'Stoat lure in a can' available within 3 years



Biosensors

- Species identification for pest surveillance and detection
 - Goal: Underpinning development for cheap, reliable and ultra-sensitive electrical biosensors that can be remotely monitored



Cape to City A Flagship Site

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- Transformational vision
- Multiple outcomes (economic, social, cultural, environmental)



Partners

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Landcare
Research
Manaaki
Whenua



QEI National Trust
Open Space New Zealand
Ngā Kairauhī Papa



Department of
Conservation
Te Papa Atawhai

PREDATOR
FREE 2050





HONOLULU CHALLENGE

BOLD ACTION ON INVASIVE ALIEN SPECIES



IUCN
World
Conservation
Congress
Hawai'i 2016

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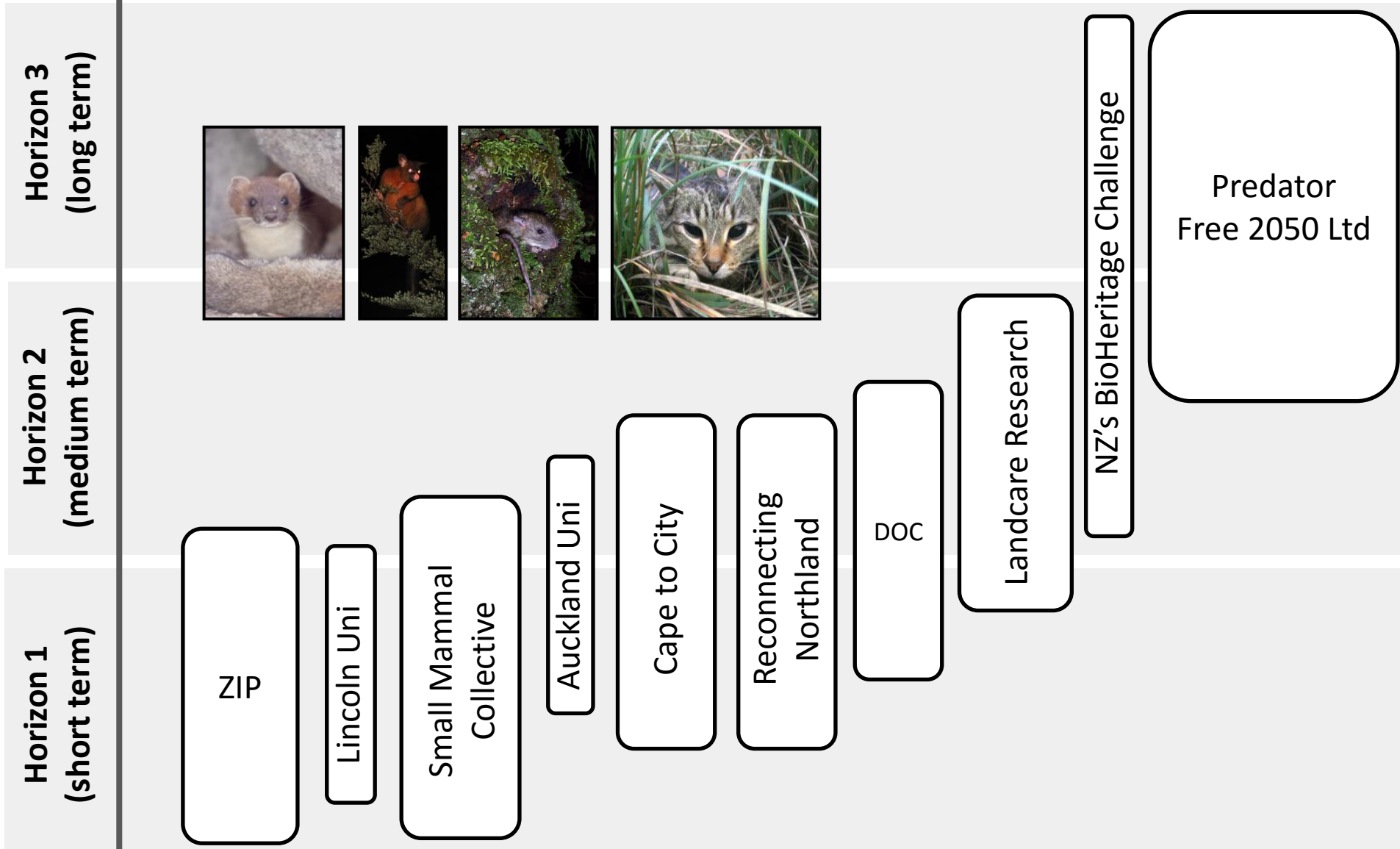
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Ecosystems and
Invasive Species
Thematic Group



Research roadmap to a Predator-Free New Zealand



WE'RE DOOMED!!
THEY'VE FARMARKED
\$28 MILLION TO
ERADICATE US!!

JUST RELAX! THEY
POURED \$26 MILLION
INTO CHANGING
THE FLAG.



NO WORRIES!
POSSUMS-
NO WORRIES!

TREMAIN



Photo: Craig McKenzie

Predator-Free New Zealand?

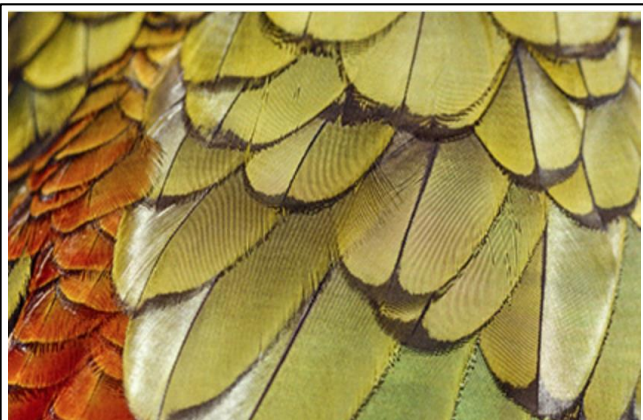
Lots of projects



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Taonga of an island nation:
Saving New Zealand's birds

May 2017



Parliamentary Commissioner
for the **Environment**
Te Kaitiaki Taiaio a Te Whare Pāremata



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How to connect to the Biological Heritage Science Challenge

www.biologicalheritage.nz

@BioHeritage_NZ



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Hosted by



Landcare Research
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